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The Welfare Effects of Single Rooms in German Nursing Homes: A Structural Approach*

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Abstract

We analyze the welfare effects of single rooms in German nursing homes using a large panel dataset containing information on prices, residents, and facility characteristics for the years 2007 and 2009. We estimate a one-level nested logit model of demand and, based on the model of bargaining between payers and providers, recover the marginal costs and markups. We then analyze a counterfactual scenario under which only single rooms are offered. According to our estimates, if no corresponding total capacity changes occur, this policy increases consumer surplus by 1.8% and providers' variable profits by 5.1%. However, under the scenario of reduced capacities, where double rooms are simply transformed into single rooms, consumer surplus decreases by 6.6% and providers' variable profits by 16.2%. To ensure the positive welfare effects of a single room policy, the supply of nursing home places must be secured by investing in new facilities.

JEL classification: I11, I18, L13, L51

*K*eywords: single rooms; nursing homes; policy simulation; structural models; bargaining.

1 Introduction

Nursing homes and other forms of long-term care have been subject to much attention in recent years, both from the public and from researchers alike.[1] The main reason behind the increased focus on long-term care is a rise in demand due to

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[1]Long-term care refers to services aimed at providing assistance to individuals who, owing to a physical, psychological, mental disease or handicap, require significant support to carry out the daily and recurring activities of everyday life for a minimum of six months (SGB XI §14).

population aging and the limited availability of informal caregivers. The size of the care-dependent population in Germany is projected to increase from 2.6 million in 2013 to 3 million in 2020 and to 3.5 million in 2030 (Augurzky et al., 2013). The same projection for the US foresees an increase from 12 million in 2010 to 27 million in 2050 (Commission on Long-Term Care, 2013). Nursing homes provide support for chronic care needs; the duration of stays is therefore longer than for hospitals and varies from months to years. For example, the estimate of the average length of nursing home treatment in the US between 1992 and 2006 was 13.7 months (Kelly et al., 2010), while the corresponding estimate for the UK between 2008 and 2010 was 26.3 months (Forder and Fernandez, 2011). In this context, the issues of well-being and life quality take priority.

The emerging concept of long-term care is a person-centered care (Calkins and Cassella, 2007) which affirms the rights to autonomy, privacy, and dignity and reiterates the importance of self-directed care and flexible forms of living. The core of this concept are adequate living arrangements for nursing home residents, primarily the possibility to live in a single room. The relevance of a person-centered care has been acknowledged by the German federal state of Baden-Wuerttemberg, with the regulation that nursing homes must provide exclusively single rooms by 2019.[2] The federal state of North Rhine-Westphalia has followed suit, stipulating that nursing homes must provide at least 80% of places in single rooms by 2018.[3] However, the providers warn of the detriments of this legislation, which include a deteriorated financial position and, possibly, a market exit.[4]

The policy mandating exclusively single rooms is controversial as, though it produces benefits to nursing home residents, there are also substantial implementation costs to the providers. On the one hand, living in a single room is associated with a higher well-being, satisfaction, and a range of health benefits. Available studies suggest that single rooms are among the most desired characteristics of a nursing home (Lawton and Bader, 1970; Mosher-Ashley and Lemay, 2001; Calkins and Cassella, 2007). As implied by research into acute care settings, residents living in a single room have undisturbed communication with staff and visitors and avoid conflicts with roommates (Chaudhury et al., 2005). Furthermore, they tend to express high satisfaction with their current living arrangement (Pinquart and Burmedi, 2004). The key clinical benefits of single rooms include a lower prevalence of infections (Drinka et al., 2003; Coleman, 2004) and less negative sleep patterns (Schnelle et al., 1999). Yet transforming doubles into single rooms implies high fixed costs, potential capacity reductions and, thus, lower investment returns. This might in turn jeopardize the care quality, endanger the future provision of capital, and reduce the overall investment activity. Moreover, the inability to recoup investments over a reasonable time horizon increases the danger of market exit. The evaluation of the welfare effects of a single room policy is therefore an empirical issue.

In addition to single rooms, the literature on long-term care explores the issues of

[2]Sources: Einzelzimmervorgabe bei Pflegeheimen bleibt, Press release of the state of Baden-Wuerttemberg, `http://www.baden-wuerttemberg.de/de/service/presse/pressemitteilung/pid/einzelzimmervorgabe-bei-pflegeheimen-bleibt-1/`, accessed on February 10, 2016

[3]Source: Fragen und Antworten zum GEPA NRW, Ministerium für Gesundheit, Emanzipation, Pflege und Alter des Landes Nordrhein-Westfalen, `http://www.mgepa.nrw.de/pflege/rechtsgrundlagen_2014/FAQ_GEPA/index.php`, accessed on February 12, 2016.

[4]Neues Alten- und Pflegeegsetz beschlossen, Caritas in NRW, `http://www.caritas-nrw.de/themendossiers/altenhilfeundpflege/neues-alten-und-pflegegesetz-beschlossen`, accessed on February 10, 2016.

assisted living concepts (Shura et al., 2010; Corazzini et al., 2015) and the excessive use of medications (Hughes and Lapane, 2005; Alanen et al., 2006; Stroka, 2015). Yet, these studies are descriptive in nature and/or are based on anecdotal evidence. Other issues on the research agenda include the impact of public quality evaluations and staffing standards on long-term care quality (Mukamel et al., 2008; Park and Stearns, 2009; Grabowski and Town, 2011; Mukamel et al., 2012; Lin, 2014; Herr et al., 2015) and demand (Grabowski and Town, 2011; Werner et al., 2012). Another strand of literature explores the relationship between quality, prices, and competition (Grabowski, 2004; Forder and Allan, 2014; Mennicken et al., 2014; Herr and Hottenrott, 2016). However, all these studies neglect the welfare of nursing home residents and the overall welfare implications of regulatory interventions.

This paper seeks to evaluate the welfare effects of a policy mandating exclusively single rooms by quantifying its benefits and juxtaposing them with the resulting costs. We contribute to the sparse literature on the value of privacy in nursing homes and to a broader strand of literature on choice and welfare in the long-term care market. We are the first to estimate a structural model of demand and supply for stationary long-term care using the data on all German nursing homes for the years 2007 and 2009. This issue is relevant for three reasons. First, long-term care is the fastest growing segment of the German health care sector, which expanded at an annual rate of 2.8% between 1999 and 2011. Furthermore, public expenditures and private capital in this sector are substantial (Augurzky et al., 2015). Second, evidence on the market behavior of care-dependent individuals in Germany is sparse. This obscures the impact of regulatory interventions aimed at fostering competition and enhancing consumer welfare in the long-term care market, such as public quality evaluations and staffing standards. Finally, the procedure for evaluating care-dependency is uniform across the federal states and is based on the needs for assistance in performing the activities of daily living. This enables a comparability between the care-dependent populations across the federal states. Hence, we are able to determine the potential market size, which is the basis for our analysis.

Our methodological approach is based on Berry (1994) and builds on recent empirical studies modeling individual behavior in the health care markets (Bundorf et al., 2009; Varkevisser et al., 2012; Werner et al., 2012; Gowrisankaran et al., 2015). These studies employ structural econometric models which are better-suited to capture the market complexities. Yet, in contrast to them, we circumvent the usage of arbitrary quality measures, such as staff-to-residents ratios and measures defined by the regulatory authorities. Instead, we take a more direct approach by exploring the effects of change in one crucial characteristic of a nursing home. We recover the marginal costs and markups using a bargaining model between providers and payers, which is more illustrative of the real price-setting mechanism and, unlike the Nash-Bertrand competition model, generates positive marginal costs (Gowrisankaran et al., 2015). Finally, our dataset is a comprehensive sample of all German nursing homes over the two years, which enables us to a) exploit the time-variation in demand to identify consumer preferences, b) address the endogeneity of prices, and c) gain additional insights into the functioning of a large and growing, but relatively unresearched market.

Our dataset (Pflegestatistik) is provided by the Statistical Offices of the German federal states and used on-site at the Research Data Centre Duesseldorf. It contains annual information on nursing homes' prices, residents, staff, size, room configura-

tion, and ownership. We apply a one-level nested logit model of demand and use the ownership type as a nesting criteria. This grouping structure reflects the individual heterogeneity of preferences. Potential market size is defined as the size of the care-dependent population in a county. The outside option includes ambulatory and informal long-term care. As a first step, we estimate the mean own-price elasticity of demand at -0.752 and the cross-price elasticities in the range 0.004–0.046. In the second step, we recover marginal costs and markups based on a Nash bargaining model between providers and payers, the latter including social assistance and long-term care insurance funds. As the co-payments in this market are below the total price, we use the marginal cost estimates to calculate the price elasticities of demand under the hypothetical full co-payment scenario. The mean estimate of -1.404 lies above the actual own-price elasticity, implying that the long-term care insurance dampens the responsiveness of consumers to differentiated provider prices. Next, we estimate the price elasticities of demand under the hypothetical scenario of Bertrand-Nash competition and the current level of co-payments. The mean price elasticity of -2.552 indicates that the existing price level under Bertrand-Nash competition would be attained only under substantially higher price elasticities of demand. Therefore, price negotiations counter the market power of providers facing price-inelastic consumers. Using the estimated demand and supply parameters of our preferred model, we simulate the equilibrium prices, market shares and welfare under the counterfactual scenario of exclusively single rooms.

The average ratio of single rooms to total available places in the period 2007 to 2009 was 0.58. Increasing this ratio to 1 has different welfare implications, which depend on the corresponding changes in nursing home capacities. We explore four implementation scenarios: a) constant capacities, where the same number of beds are secured by expanding the facilities or, if possible, by splitting double rooms; b) reduced capacities, whereby double rooms are transformed into single without being divided; c) reduced capacities, whereby 50% of double rooms are transformed into single by being divided and 50% without being divided; d) equivalent to scenario c), with the payers' bargaining power of 2/3. The average prices and market shares decline under each scenario. The average share of the outside option decreases only under scenario a), from 71.1% to 69.2%. In this case, due to a single room policy, stationary care becomes more attractive than the alternative forms of long-term care. This increases consumer surplus by 1.8% and providers' variable profits by 5.1%. Under scenario b), the average market share of the outside option increases to 75%. Consumer surplus decreases by 6.6% and providers' variable profits by 16.2%, implying that the negative welfare effects of lower capacities clearly outweigh the positive welfare effects of single rooms. Under scenario c), lower capacities raise the average share of the outside option to 72%, which leads to a decrease in consumer surplus of 2.6% and in providers' variable profits of 5.5%. Finally, under scenario d), consumer surplus decreases by 2.4% and providers' variable profits by 35.1%. Therefore, the policy mandating exclusively single rooms is welfare-enhancing only if the total nursing home capacities remain unchanged and the bargaining power is symmetric.

In section 2, we describe the institutional characteristics of the German long-term care market. Section 3 describes our model and the identification strategy. In section 4, we present the descriptive statistics and in section 5 discuss the results. Finally, section 6 concludes.

2 The German Long-Term Care Market

Long-term care insurance (LTCI) in Germany has been mandatory since 1995 and follows the health insurance. Members of the public health insurance schemes are automatically enrolled into public LTCI, and those privately insured are obliged to purchase private LTCI offering the same set of benefits. Public LTCI covers the basic long-term care needs and includes 90% of the population. LTCI beneficiaries are entitled to a lump-sum allowance, which is uniform across the federal states, but varies depending on the form of care and on the individual care-dependency level. The LTCI allowance is a fraction of the total caregiving price and the co-payments are often substantial. If the LTCI beneficiaries or their families are unable to bear the remaining expenses, social insurance funds step in. The entitlement to an LTCI allowance is based on whether a care-dependent individual requires assistance with at least two basic activities (hygiene, feeding, and mobility) and one instrumental activity of daily living (cooking, cleaning, grocery shopping). The level of care-dependency is defined based on the frequency and duration of necessary assistance. Individuals in care level 1 require at least 90 minutes of care per day, whereby the minimum of 46 minutes must be attributable to basic care. In care level 2, the daily need for assistance is at least three hours, with two hours attributable to basic care. Finally, in care level 3, the corresponding daily need is at least five hours, with four hours of basic care.

The German long-term care system is organized around the principle "Prevention and rehabilitation before care, outpatient care before inpatient care and short-stay care before full-time inpatient care" (SGB XI §2), in an effort to enable care-dependent individuals to stay in their familiar environment for as long as possible. Domiciliary care includes informal (through third persons) and ambulatory care, while stationary care includes full-time and short-time nursing home care. As of 2013, 69.4% of care-dependents were in domiciliary care, out of whom 23.9% used ambulatory care services, while 30.6% were treated stationary (Augurzky et al., 2015). The LTCI beneficiaries are generally free to choose their preferred treatment facility, although those entitled to social assistance face a restricted choice.

Prices for stationary long-term care consist of three components: a) nursing charge, which varies across the care levels and covers assistance with basic and instrumental activities of daily living; b) uniform charge for room and board; and c) investment charge for facility maintenance, which varies depending on the room size. The long-term care allowance covers only a fraction of the nursing charge. Prices are not freely set, but are negotiated between providers and payers on behalf of the LTCI beneficiaries. Payers are organized at the federal state level and include social insurance funds, long-term care insurance funds, and a range of smaller players such as associations of nursing home owners (for example, Red Cross, Caritas, Diakonie) and private health insurance funds. Prices are determined for a certain period in advance, with a minimum of one year. Negotiations are initiated following the disclosure of the past, current, and expected costs and are carried out for each facility separately. Social insurance funds have a veto right over the negotiated price, and therefore the power to return negotiators to the table. If the price cannot be agreed upon within six weeks, an independent arbitration board determines it.

3 Empirical Strategy

To evaluate the welfare effects of a single room policy in German nursing homes, we a) estimate the structural model of demand for stationary long-term care, b) recover the marginal costs and markups, and c) simulate the prices and market shares under the given counterfactual scenario. We focus on nursing homes providing care for elderly individuals and exclude more specialized facility types, i.e., for patients with psychological and mental disorders and hospices.

3.1 Demand Model

We observe m = 1,..., 412 geographic markets (counties) over t = 1, 2 time periods. In our context, broader market definition would be inappropriate, as the distance between current residence and treatment facility is one of the major choice determinants (Varkevisser et al., 2012; Stroka and Schmitz, 2014; Gowrisankaran et al., 2015). Potential market size (m) corresponds to a size of the care-dependent population in a county. There are i = 1,..., m care-dependent individuals, who choose between j = 1,..., J nursing homes offering long-term care in each period t. The agent might also decide to choose domiciliary or short-term stationary care, which is the outside option. We model the choice as a utility-maximization problem of a representative consumer and approximate it by a one-level nested logit model (Berry et al., 1995; Verboven, 1996; Slade, 2004), which accounts for the correlation of preferences across nursing homes.

The agent i's indirect utility from choosing the nursing home j in period t takes the following form:

$$u_{ijt} = \delta_{jt} + v_{ijt},$$

where δ_{jt} captures the mean utility derived from j and v_{ijt} represents the individual-specific deviation from the mean. δ_{jt} is invariant across all nursing home residents, while v_{ijt} is a structural term which allows for the correlation of utilities between nursing homes with similar characteristics. We define δ_{jt} as:

$$\delta_{jt} = \beta x_{jt} - \alpha p_{jt} + \xi_{jt}, \tag{1}$$

where x_{jt} and ξ_{jt} capture j's observable and unobservable characteristics, respectively, and p_{jt} are the individual co-payments. The utility from the outside option is normalized to zero ($u_{0t} = 0$).

Nursing homes are grouped based on the similarity of their structural characteristics (see subsection 3.2). This grouping structure is captured by the term v_{ijt}, which is defined as:

$$v_{ijt} = \epsilon_{igt} + (1 - \sigma)\epsilon_{ijgt},$$

where σ measures the correlation of preferences for nursing homes within the same group. The parameters ϵ_{igt} and $\epsilon_{igt} + (1 - \sigma)\epsilon_{ijgt}$ are Type-I extreme value distributed. At $\sigma = 1$, preferences are perfectly correlated, while $\sigma = 0$ implies no correlation of preferences. In the latter case, $\epsilon_{igt} + (1 - \sigma)\epsilon_{ijgt}$ is i.i.d. and nested logit reduces to a standard logit model. In line with a random utility maximization, we assume $0 < \sigma < 1$, implying that the substitution within groups is higher than the substitution between groups. This property of nested logit addresses the well-

known issue of a standard logit model, where the substitution between the products does not depend on their characteristics, but only on the respective market shares.

The market share of product j is calculated as the probability of choosing j conditional on choosing the group g:

$$Pr_j = Pr_{j|g,t} \cdot Pr_g.$$

From this expression, Berry (1994) derives the nested logit demand equation, which links market shares to prices, product characteristics, and within-group shares:

$$ln(s_{jt}) - ln(s_{0t}) = \beta x_{jt} - \alpha p_{jt} + \sigma ln(s_{j|gt}) + \xi_{jt}. \tag{2}$$

Equation (2) is our workhorse equation for the demand estimation.

3.2 Nesting Structure

Our nesting structure exploits the ownership type and distinguishes between for-profit and non-profit nursing homes. For-profit nursing homes are owned by private investors and operate with an explicit profit-maximization objective. Non-profit nursing homes are often associated with charitable or religious organizations and profits are not the primary purpose of their nursing activity. For example, Red Cross defines its mission as to "protect life and health and to ensure respect for the human being," Caritas shares the mission of a "Catholic Church to serve the poor and to promote charity and justice," while Diakonie strives to "address the wants and needs of others based on the Christian view of a mankind." The German long-term care market is dominated by non-profit nursing homes, although for-profit facilities are gaining an increasingly important role.[5]

The non-profit ownership can serve as a low-cost signal for quality in markets with information asymmetries (Arrow, 1963; Hansmann, 1980; Hirth, 1999; Glaeser and Schleifer, 2001). If the quality is uncertain or its evaluation is not feasible prior to the purchase decision, consumers cannot fully monitor contractual compliance. In this situation, for-profit organizations might provide suboptimal quality on imperfectly observable dimensions if this strategy is profitable. In contrast, non-profits have a weaker non-compliance incentive due to the non-distribution constraint, which prohibits the payment of profits to owners or employers (the Arrow-Hansmann hypothesis).[6] Moreover, the association with charitable or religious organizations may make the non-profits less willing to compromise on quality. Arrow (1963) explains the prevalence of the non-profit sector in the health care markets by the contradiction between the profit motive and the trustworthiness necessary for the provision of a high quality. The key implication from the theoretical studies is that, due to their implicit quality assurance, consumers with a high informational cost have a preference for non-profit organizations.

[5] As of 2013, market shares of for-profit and non-profit nursing homes were 36.4% and 63.6%, respectively, while the corresponding shares in 1999 were 25.4% and 74.6%. During this period, the number of available places increased by 105% in for-profit and 25% in non-profit homes (Augurzky et al., 2015).

[6] According to the German tax code, non-profit organizations may use their profits solely for the purpose of fostering the nursing activity (Abgabenordnung, §52 Gemeinnützige Zwecke). The payment of profits to owners or employers is therefore ruled out.

Empirical studies on the long-term care market find discernible quality differences between for-profit and non-profit nursing homes for consumers facing high information asymmetries, for example, if family members visit rarely and cannot control the quality of treatment. Yet, these differences vanish when consumers are well-informed (Chou, 2002; Grabowski and Hirth, 2003). Non-profit nursing homes can also have positive quality spillovers for for-profit facilities (Grabowski et al., 2013). Poorly informed consumers are more likely to opt for non-profit nursing homes, which increases the probability that for-profit facilities will also deliver optimal quality when the share of this consumer type is high. Our descriptive statistics in Table 5 indicates that for-profit nursing homes set lower prices, which might be appealing to well-informed consumers. Therefore, we assume that the ownership type serves as a quality signal and provides an appropriate nesting criteria.

3.3 Identification

Equation (2) cannot be estimated by OLS due to the endogeneity of prices and within-group market shares. The structural error term ξ encapsulates the unobservable factors including quality, staff attentiveness, location or reputation. These factors simultaneously affect prices, within-group shares, and total market shares. For example, nursing homes with a location in an urban center or with an excellent reputation are not only likely to face higher demand and have higher within-group shares, but also to set higher prices. Systematic correlation between explanatory variables and the error term induces endogeneity, which produces inconsistent coefficient estimates. To identify the true effects of endogenous variables on demand, we employ a) fixed effects and b) instrumental variables. Fixed effects capture all time-invariant sources of the correlation between explanatory variables and the error term, which provides consistent estimates of the effects of variables correlated with time-invariant unobserved factors. Instrumental variables capture the correlation between explanatory variables and *changes* in the error term. This approach addresses the endogeneity issue by employing instruments which are uncorrelated with the error term, but highly correlated with endogenous variables. Therefore, our identifying assumption is $E[p_{jt}, s_{j|gt}|\xi_{jt}] = 0$.

Our price instruments are the average co-payments for nursing homes with comparable size and staff-to-residents ratios located in the same federal state, but in different counties.[7] Due to similar structural characteristics and price negotiations with the same group of payers, these homes are expected to have uniform cost components and therefore correlated prices (Hausman et al., 1994). Furthermore, the prices of homes which meet these two criteria are considered as a reference in price negotiations (SGB XI §84). In order to ensure that our price instruments are uncorrelated with the unobserved demand shocks, we exclude homes from all immediately neighboring counties and counties whose central point is located less than 60km away. Due to distance from their current residence, patients are unlikely to choose the nursing homes in the remaining counties in the federal state. As an instrument for the within-group share, we employ the number of nursing homes with the same own-

[7] We establish comparability between the nursing homes based on two criteria: a) deviation in capacities is less than 20 places, b) deviation in staff-to-residents ratio is less than 10%. Prices of the five most similar homes are employed as instruments. As a robustness check, we lower the number of homes to two.

ership type.[8] Market entry process for nursing homes entails high sunk costs and generally occurs over a longer time horizon; hence, the short-term demand shifts are unlikely to alter the number of nursing home providers. Our price and within-group share instruments can therefore be considered exogenous.

Several institutional characteristics of the long-term market may affect the reliability of our estimates. First, we cannot distinguish between the LTCI beneficiaries who bear the full cost of their treatment (net of LTCI contribution) and those entitled to social assistance. Since we observe the prices charged by nursing homes and not the individual co-payments, the actual price elasticities might be higher. Second, although the care-dependent individuals entitled to social assistance are allowed to choose their preferred facility (SGB XII §9), social insurance funds might nonetheless restrict the choice. Finally, the preferred nursing home might not always offer the treatment due to capacity limitations. In this instance, the short-term stationary care (up to four weeks) substitutes for long-term care until a suitable nursing home is found (SGB XI §42). Therefore, although the observed choice generally reflects the true individual preferences, this assumption is not always met.

3.4 Elasticities

For a clear interpretation of the estimated price coefficients, we calculate the price elasticities of demand. The own-price elasticity measures the responsiveness of the demand for nursing home j to changes in its own price. Following Berry (1994), we express it as:

$$\eta_{jjt} = \alpha p_{jt} \left(s_{jt} - \frac{1}{1-\sigma} + \frac{\sigma}{1-\sigma} s_{j|gt} \right). \tag{3}$$

Cross-price elasticities capture the effect of price changes of nursing home k on the demand for j. We distinguish between the elasticities with respect to homes in the same group g and in different groups h and calculate them as:

$$\eta_{jkt} = \begin{cases} \alpha p_{jt} \left(\frac{\sigma}{1-\sigma} s_{j|gt} + s_{jt} \right), & j \in g, k \in g \\ \alpha p_{jt} s_{jt}, & j \in g, k \notin g, k \in h. \end{cases} \tag{4}$$

3.5 Supply Side

We estimate the supply side using a model of oligopolistic competition with differentiated products (Berry et al., 1995; Verboven, 1996; Slade, 2004). Nursing homes are assumed to operate as single-product firms and differ across multiple dimensions. The produced long-term care is a vector of characteristics which reflect distinctive features of a nursing home. Typically, the differentiation stems from physical location, ownership, size, and quality of care. Hence, we assume that all nursing homes within the relevant market are to some degree substitutable. We recover the extent of substitution based on the estimates of the cross-price elasticities from equation (4). Our supply side model is based on the assumption of bargaining between providers and payers. We build upon a classic bargaining model by Horn and Wolinsky (1988)

[8] Within-group instruments are inverted and log-linearized in order to ensure a positive correlation with the endogenous variable.

and models of bargaining in the health care markets (Grennan, 2013; Gowrisankaran et al., 2015).

We assume that payers negotiate the price with each nursing home separately.[9] The outcome of negotiations is a solution to a Nash bargaining problem, which depends on the objective utility functions of negotiators. Payers negotiate on behalf of the LTCI beneficiaries and are assumed to maximize their utility with respect to observable facility characteristics.[10] This might be a strong assumption, given that the payers' side includes several actors with diverging, sometimes conflicting interests. Social insurance funds generally insist on lower prices and have no inherent interest in quality assurances, since their goal is to minimize the share of nursing home residents entitled to social assistance. However, this principle is unlikely to apply to all nursing homes, as some of them offer higher standards of care and are available to self-paying LTCI beneficiaries only. On the other hand, the long-term care insurance funds provide a lump-sum amount for each nursing home resident and have no incentive to negotiate lower prices. Yet, they have initiated a system of public quality reporting and might therefore be more concerned about the care quality. Our dataset spans the time period prior to public quality evaluations and does not include data on the shares of social assistance beneficiaries, which does not allow us to infer more details on the patterns of negotiations. The objective utility function of a nursing home is assumed to depend on its profit motive. For-profit homes have a pure profit-maximizing objective, while non-profit homes maximize a weighted combination of their profit and output (Gaynor and Vogt, 2003; Lakdawalla and Philipson, 2006).

The Nash bargaining problem between payers and providers takes the following form:

$$NB^{jt,s} = (U_{jt} - U_{0t})^{\gamma_j} (V_{jt} - V_{0t})^{\gamma_s}, \tag{5}$$

where U_{jt} and V_{jt} are the payoffs from an agreement to nursing home j and payer s in period t, respectively, U_{0t} and V_{0t} are the corresponding payoffs without an agreement, and γ_j and γ_s are the respective bargaining powers. Without loss of generality, we assume that $\gamma_j + \gamma_s = 1$ and denote the bargaining powers as $\gamma_j = \gamma$ and $\gamma_s = 1 - \gamma$. If negotiations fail and a nursing home rejects the price determined by an independent arbitration board, it exits the market. Therefore, the value of disagreement to both parties is equal to zero, $U_{0t} = V_{0t} = 0$. Combining the objective utility functions elaborated above with the disagreement values and the Nash bargaining setup, we arrive at the following expression:

$$NB^{jt,s} = [\underbrace{(\beta x_{jt} - \alpha p_{jt} + \xi_{jt})}_{\delta_{jt}} q_{jt}]^{\gamma} \, [\theta_{\pi}(p_{jt} + l_{jt} - c_{jt})q_{jt} + \theta_q q_{jt}]^{1-\gamma}, \tag{6}$$

where δ_{jt} denotes the mean utility derived from nursing home j at period t, q_{jt}, p_{jt} and l_{jt} represent the demand, co-payments, and LTCI contributions, respectively,

[9] In the German long-term care market, nursing home chains are relatively common, implying that one provider might negotiate on behalf of multiple facilities. Yet, the prices should be independent of each other, irrespective of the chain membership (SGB XI §85).

[10] This assumption does not rule out the necessity of regulatory intervention, since long-term care is a credence good. For example, staff engagement and attentiveness greatly influence the quality of care but are unobservable by the payers and, hence, are not a subject of negotiations. In this context, the aim of public quality reporting is to provide information on the unobserved aspects of care quality to prospective nursing home residents.

and c_{jt} are the estimated marginal costs. θ_π and θ_q capture the relative values placed on profits and outputs by nursing home j, whereby $\theta_\pi + \theta_q = 1$. Output does not enter the objective utility function of for-profit providers; thus $\theta_q = 0$.

Optimizing equation (6) with respect to price gives the following expression for the marginal cost:

$$MC_{jt} = \underbrace{c_{jt}}_{\substack{\text{“true”} \\ \text{MC}}} - \underbrace{\frac{\theta_q}{\theta_\pi}}_{\text{MRS}} = p_{jt} + l_{jt} - \frac{\delta_{jt}(1-\gamma)}{\alpha\gamma - \delta_{jt}\frac{\eta_{jjt}}{p_{jt}}}, \tag{7}$$

which is equal to the difference between the “true” marginal cost (c_{jt}) and the marginal rate of substitution (MRS) between profit and output. The terms c_{jt} and $\frac{\theta_q}{\theta_\pi}$ cannot be identified separately; thus, we estimate the “behavioral” marginal cost, which is equal to $c_{jt} - \frac{\theta_q}{\theta_\pi}$ for non-profit and c_{jt} for for-profit nursing homes (Gaynor and Vogt, 2003).

Marginal costs cannot be estimated analytically because the expression (7) is non-linear. Therefore, we make an assumption of symmetric bargaining powers ($\gamma = \frac{1}{2}$) and motivate it by several facts. First, if the bargaining parties fail to agree and the price set by an independent arbitration board is rejected, the nursing home exits the market. This implies the discontinuation of the treatment, which is an outcome with serious negative welfare implications for nursing home residents. Hence, the payers are unlikely to exert bargaining power to a degree which stymies the profitable operations of a nursing home. Second, bargaining parties are in a repeated interaction, which should entail similar discount factors (Rubinstein, 1982). Third, symmetric bargaining powers are roughly in line with the estimates from the empirical literature (Crawford and Yurukoglu, 2012; Gowrisankaran et al., 2015). Finally, the assumption that the bargaining power is largely concentrated at the payers' side implies that prices are set at the level close to marginal costs. While not wrong *per se*, this implies that policy changes have little or no impact on prices, which is unrealistic. Yet, to assess the robustness of our results, we allow for asymmetric bargaining powers and assume $\gamma = \frac{2}{3}$ in section 5.2.

In our framework, bargaining model has two key advantages over the Nash-Bertrand competition, where the price is set by providers as a strategic variable. First, it better approximates the price-setting mechanism in the German long-term care market. Second, it generates more reasonable marginal cost estimates. Since the co-payments for nursing home stays are below the actual prices, the estimated elasticities are lower than under the full co-payment scheme. In a Nash-Bertrand setting, providers might exploit lower elasticities to set higher prices. Applying the competition model would therefore result in unrealistically low marginal costs (Gowrisankaran et al., 2015).

3.6 Simulation

To evaluate the welfare effects of the policy mandating exclusively single rooms in German nursing homes, we compare the status quo market with double rooms with the hypothetical market with single rooms only. We motivate this scenario with a

recent policy change in the federal states of Baden-Wuerttemberg and North Rhine-Westphalia. Although the single rooms are expected to enhance the well-being of nursing home residents, the cost of rebuilding and potential capacity reductions might affect the financial position of providers and the utility of care-dependent individuals via higher prices and more restricted choice. We evaluate four implementation scenarios: a) constant capacities, where the facilities are either expanded or double rooms are split into singles; b) reduced capacities, whereby double rooms are transformed into singles without being divided; c) reduced capacities, whereby 50% of shared rooms are transformed into singles by being divided and 50% without being divided; d) equivalent to scenario c), with the payers' bargaining power of 2/3. Capacity changes and the higher availability of single rooms are expected to affect consumer utilities and providers' variable profits, which is the basis of our welfare analysis.

We assume that the consumer valuation of observable nursing home characteristics, price sensitivity, and marginal costs (MC) remain constant in the hypothetical market with exclusively single rooms. The ratio of single rooms to total available places increases to 1 for each nursing home, while the number of available places changes under each scenario. We define the nested logit demand function as:

$$\ln(s_{jt}(\mathbf{p}_t^{sim}, \delta_{jt})) - \ln(s_{0t}(\mathbf{p}_t^{sim}, \delta_{jt})) = \hat{\beta} x_{jt} - \hat{\alpha} p_{jt}^{sim} + \hat{\sigma} \ln(s_{j|gt}(\mathbf{p}_t^{sim}, \delta_{jt})) + \xi_{jt}, \quad (8)$$

where $\hat{\alpha}$, $\hat{\beta}$ and $\hat{\sigma}$ are estimated from equation (2). Based on the expression for marginal costs (7), we specify the first-order condition as:

$$p_{jt}^{sim} + l_{jt} - \widehat{MC}_{jt} - \frac{\delta_{jt}(1-\gamma)}{\hat{\alpha}\gamma - \delta_{jt}\frac{\eta_{jjt}(p_{jt}^{sim}, s_{jt}(\mathbf{p}_t^{sim}, \delta_{jt}))}{p_{jt}^{sim}}} = 0. \quad (9)$$

We determine the equilibrium simulated prices p_{jt}^{sim}, market shares $s_{jt}(\mathbf{p}_t^{sim}, \delta_{jt})$ and within-group shares $s_{j|gt}(\mathbf{p}_t^{sim}, \delta_{jt})$ by simultaneously optimizing equations (8) and (9) using the Newton-Raphson algorithm. With the new equilibrium values of prices, market shares, within-group shares and the estimated structural parameters $\hat{\alpha}$, $\hat{\beta}$ and $\hat{\sigma}$, we calculate the consumer surplus following Ivaldi and Verboven (2005):

$$CS(\mathbf{p}_t^{sim}) = \frac{1}{\hat{\alpha}} M \ln(1 + \sum_{g=1}^{G} D_{gt}^{1-\hat{\sigma}}), \quad (10)$$

where $D_{gt} = \sum_{j \in G} \exp(\frac{\delta_{jt}}{1-\hat{\sigma}})$. Providers' variable profits are calculated as:

$$\Pi(\mathbf{p}_t^{sim}) = (p_{jt}^{sim} - \widehat{MC}_{jt}) q_{jt}(\mathbf{p}_t^{sim}), \quad (11)$$

where q_{jt} is the demand for nursing home j at time t given the simulated prices $\mathbf{p}_t^{sim}$ and $\widehat{MC}_{jt}$ is the estimate of marginal costs. The magnitude of fixed costs associated with policy implementation cannot be assessed from the available data. Our evaluation of the welfare effects of the single room policy is therefore limited to the comparison of the counterfactual and status quo values of consumer surplus and providers' variable profits.

4 Dataset and Descriptive Statistics

Our dataset is provided by the Statistical Offices of the German federal states and used on-site at the Research Data Centre Duesseldorf. It comprises all nursing homes offering full-time stationary care for the elderly for 2007 and 2009.[11] In addition, we observe a number of LTCI beneficiaries in the domiciliary care, which is defined as the outside option. The total market size (M) corresponds to a number of care-dependent individuals in a county. The evaluation of care-dependency is based on a standardized procedure developed by the long-term care insurance funds, which ensures homogeneous market conditions across the counties and, therefore, provides a consistent estimate of the market size.

Table 1: Summary statistics

	Total		**For-profit**		**Non-profit**	
	mean	s.d.	mean	s.d.	mean	s.d.
Market shares						
s_j [in ‰]	0.013	0.013	0.010	0.010	0.015	0.014
$s_{j\|g}$ [in %]	0.093	0.104	0.112	0.139	0.080	0.070
s_0 [in %]	0.711	0.067	0.706	0.071	0.714	0.065
Size	81.19	48.28	71.38	49.19	87.74	46.52
Extra facilities	0.30	0.46	0.25	0.43	0.33	0.47
Single rooms [in %]	0.58	0.28	0.48	0.28	0.64	0.25
Weighted average price* [EUR]	1477.32	435.23	1402.13	429.23	1527.86	431.94
Price per care level*						
Care level 1	1258.15	398.62	1219.60	412.00	1284.06	387.24
Care level 2	1416.95	435.73	1347.32	430.48	1463.76	432.99
Care level 3	1685.05	477.83	1579.15	456.67	1756.23	478.57
Instruments, price* [EUR]						
Price, comparable home 1	1479.00	435.35	1449.94	431.54	1497.02	436.90
Price, comparable home 2	1473.86	440.78	1447.14	438.13	1491.81	441.67
Price, comparable home 3	1466.99	429.25	1437.74	417.08	1486.65	436.15
Price, comparable home 4	1468.83	436.48	1436.91	425.82	1490.28	442.23
Price, comparable home 5	1472.32	434.62	1441.55	422.30	1492.99	441.52
Instruments, within-group share						
Number of homes, same group	18.38	18.31	18.21	20.33	18.49	16.82

We report the descriptive statistics for all German nursing homes providing the long-term stationary care for elderly for 2007 and 2009. *Price variables refer to co-payments, i.e., the prices negotiated for each nursing home net of the long-term care insurance contribution. Group g is defined based on the ownership type of a provider. Market size corresponds to the size of the care-dependent population in a county. s_j is the overall market share of nursing home j in a county, $s_{j|g}$ is its within-group share, and s_0 is the share of the outside option. All prices are expressed in EUR. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

For-profit nursing homes account for 40.1% of all facilities in the sample, while the remaining 59.9% are either private non-profit or publicly owned. We observe a range of heterogeneities across the two types of providers. Non-profit nursing homes have a larger average size (87.7 vs. 71.4 places), more associated facilities, such as hospitals, ambulatory services, and residential units (33% vs. 25%) and a higher average share of single rooms (64% vs. 48%) than for-profit facilities. We calculate the price of a treatment as a weighted average of co-payments across the

[11] Data aggregated at the federal state level is publicly available at `https://www.destatis.de/DE/Publikationen/Thematisch/Gesundheit/Pflege/LaenderPflegeheime.html`.

care levels. The weights employed are the ratios of LTCI contributions for each care level to the aggregate LTCI contributions.[12] The calculated co-payments vary between €928.7 and €1,974.8 (tenth and ninetieth percentile), with the mean value of €1,477.3. This variation reflects both regional price divergences and differences in care quality. Non-profit nursing homes set higher average prices for each care level. Detailed summary statistics are presented in Table 5.

5 Results

5.1 Demand- and Supply-side Estimation

The results of our demand estimation are presented in Table 7. The first two columns display the coefficient estimates from OLS and FE specifications, which do not account for potential endogeneity. The third column presents the results from our preferred FE.IV specification, which includes instruments for prices and within-group shares. Both FE specifications include nursing home and year fixed effects. The coefficient σ measures the correlation of preferences within the ownership type and is positive and significant across all specifications. This confirms the importance of controlling for individual preferences. Moreover, the estimated value is in line with random utility maximization ($0<\sigma<1$). As expected, controlling for endogeneity results in higher price and lower within-group share coefficients. The FE.IV specification indicates that care-dependent individuals significantly dislike higher prices. Facility size is positively valued, which may be due to the fact that the decision to move into a nursing home is often made following a rapid health decline (for example, after a stroke or hip fracture) and under time pressure. In this setting, large nursing homes or chain members should have an edge over smaller facilities. The coefficient on the variable association with another facility is not significantly different from zero. Finally, the coefficient on the variable share of single rooms to total available places is positive, implying a higher valuation of nursing homes offering more privacy and independence. This estimate is the basis for our simulation of the effects of policy change.

To evaluate the robustness of our results, we introduce three additional specifications (Table 7). In the first one, we lower the number of price instruments from five to two. The reason for this more restrictive assumption is that the reference point in price negotiations are the most similar nursing homes. Therefore, narrowing the range of comparable facilities is more realistic than expanding it. The second specification employs the nursing home capacity as an instrument for the within-group market share. This variable proxies for the competitive pressures faced by nursing homes and is highly correlated with within-group shares. Finally, in the third specification, we allow for a structural parameter σ to differ across the ownership types. This modeling assumption is based on the empirical finding that care-dependent individuals in for-profit nursing homes are, on average, better informed (discussed in section 3.2), which might result in higher substitutability within this group. Robustness checks produce coefficient estimates comparable to our baseline specification. Moreover, specification (3) indicates that the correlation of preferences between for-profit

[12] In 2007, the LTCI contributions amounted to €1,023 for care level 1, €1,279 for care level 2 and €1,432 for care level 3. The contribution for care level 3 increased to €1,470 in 2009. Our weights are therefore 0.27 for care level 1, 0.34 for care level 2 and 0.39 for care level 3.

nursing homes is indeed higher than between non-profit nursing homes. Hence, for-profit nursing homes are, on average, better substitutes for each other, which is in line with the findings in the existing literature.

For a more precise interpretation of the estimated coefficients, we calculate the price elasticities of demand. The results are displayed in Table 3. The mean own-price elasticity is -0.752 and is slightly larger for non-profit nursing homes. This result is mostly driven by the higher average prices in this group. The average within-group cross-price elasticity is estimated at 0.041 and the between-group cross-price elasticity at 0.005. Low cross-price elasticities are likely due to a high cost of moving and adapting to a new environment, considering that nursing home transfers might be financially and emotionally burdening. In the next step, we recover the marginal costs and markups based on equation (7). The average values for the two years in our sample are presented in Table 4. The average ratio of marginal costs to prices is 0.593, and is higher for for-profit than for non-profit nursing homes (0.604 vs. 0.576). This result is somewhat surprising, since the nursing homes are reported to have low markups (Augurzky et al., 2013). However, the fixed costs of building and operating a nursing home are often substantial, which we cannot account for. As our supply-side estimation captures the variable costs only, the true markups might indeed be lower.

Table 2: Estimation results

$ls_j = lns_j - lns_0$	**OLS**	**FE**	**FE.IV**
σ [ownership]	0.68531***	0.58355***	0.50969***
	(0.00498)	(0.00721)	(0.01189)
Price	-0.00006***	-0.00003***	-0.00026***
	(0.00000)	(0.00000)	(0.00006)
Size	0.00543***	0.00422***	0.00451***
	(0.00013)	(0.00032)	(0.00035)
Extra facility	0.05869***	-0.00076	0.00169
	(0.00897)	(0.00558)	(0.00605)
Single rooms [%]	0.15987***	0.02075	0.07401**
	(0.01487)	(0.02660)	(0.03169)
Constant	-2.78668***	-2.92495***	-2.85108***
	(0.02290)	(0.03799)	(0.06855)
Observations	14,205	14,205	14,205
Facility FE	no	yes	yes
Time FE	no	yes	yes
IV (σ)	no	no	yes
IV (price)	no	no	yes
Adjusted R-squared	0.70	0.70	0.68
Underidentification test			121.59
			(0.00)
Weak ID test			20.66
Sargan test			3.00
			(0.56)

The dependent variable is $ls_j = lns_j - lns_0$, where s_j = total number of care-dependent in facility j/total market size, s_0 = market share of outside option/total market size. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

It is well-understood that long-term care insurance dampens the responsiveness of consumers to price changes. Abandoning the system of price negotiations would

Table 3: Facility-level price elasticities

	Total		**For-profit**		**Non-profit**	
	mean	s.d.	mean	s.d.	mean	s.d.
Own, actual	-0.752	0.240	-0.706	0.267	-0.783	0.237
Own, no LTCI	-1.405	0.255	-1.352	0.257	-1.439	0.248
Own, effective	-2.552	0.483	-2.457	0.489	-2.614	0.469
Cross-within	0.041	0.045	0.046	0.058	0.038	0.033
Cross-between	0.005	0.005	0.004	0.004	0.006	0.005

Elasticities are calculated using the expressions (3) and (4) and $\epsilon = (\frac{p-MC}{p})^{-1}$ for effective own-price elasticity. Except for the calculation of own-price elasticities without LTCI, we use the actual co-payment level as a proxy for price. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

likely produce a price increase. Using our marginal cost estimates, we calculate the elasticities necessary to produce the current price level under the hypothetical scenario of Bertrand-Nash competition using the formula $\epsilon = (\frac{p-MC}{p})^{-1}$. We refer to them as effective elasticities (Gowrisankaran et al., 2015). The gap between the actual and the effective elasticities indicates the value of price negotiations in hindering excessive price increases. The mean estimate of -2.552 in Table 3 is significantly larger in magnitude than the actual elasticity of -0.752. Therefore, under the current long-term care insurance rates, Bertrand-Nash competition would result in higher prices. Next, we evaluate the impact of long-term care insurance on the average price level. If the nursing home residents had to bear the full cost of their treatment, the mean own price-elasticity would increase in magnitude to -1.405, which would produce lower prices. In the opposite scenario of zero co-payments, the demand would be price insensitive. The policy of changing the long-term care insurance rates must therefore be pursued with regard to its impact on the negotiated price level.

Table 4: Marginal costs and markups

	Total		**For-profit**		**Non-profit**	
	mean	s.d.	mean	s.d.	mean	s.d.
Marginal cost [EUR]	1658.52	475.42	1566.49	479.94	1719.56	462.42
Markup (%)	0.407	0.084	0.424	0.093	0.396	0.076
Marginal cost (% of price)	0.593	0.084	0.576	0.093	0.604	0.076

Marginal costs are calculated using the expression (7) and markups as $\frac{p-MC}{p}$. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

5.2 Simulation

In the final step of our analysis, we simulate prices and the market shares which would materialize under the scenario of exclusively single rooms. The differences between the status quo and the counterfactual values of consumer surplus and providers' variable profits indicate the value of single rooms in nursing homes.

Table 5 displays the counterfactual values of prices and market shares. The average

Table 5: Mean prices and market shares under the counterfactual scenario of exclusively single rooms

	a)		**b)**		**c)**		**d)**	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
price	1459.29	465.06	1451.65	468.61	1454.35	468.55	1449.51	450.49
sj [in ‰]	0.013	0.011	0.011	0.009	0.012	0.009	0.012	0.009
sjg [in %]	0.089	0.100	0.089	0.097	0.093	0.105	0.093	0.104
s_0	0.692	0.067	0.750	0.053	0.720	0.060	0.719	0.059

Scenarios: Symmetric bargaining power ($\gamma = \frac{1}{2}$) and a) constant capacities; b) reduced capacities, whereby double rooms are transformed into singles without being divided; c) reduced capacities, whereby 50% of double rooms are transformed into singles by being divided and 50% without being divided. Scenario d) equivalent to c), with the payers' bargaining power of $\gamma = \frac{2}{3}$. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

prices decline under each scenario, although by a relatively low amount (€18–28).[13] The average market share of the outside option decreases only under scenario a), from 71.1% to 69.2%. In this instance, the long-term stationary care becomes more attractive than the outside option, since nursing homes offer exclusively single rooms and their capacities remain unchanged. Price decline is likely due to a fiercer competition between the providers. In b), c), and d), nursing homes can no longer accommodate all the current residents due to reduced capacities. This raises the average market share of the outside option to 75%, 72%, and 71.9%. Smaller sizes and a decline in the number of residents influence the payers' objective utility function, which in all three cases leads to a lower negotiated price. Finally, under the last scenario, payers have a higher bargaining power, which enables them to negotiate lower prices than under the identical implementation scenario c).

Table 6: Aggregate consumer surplus (CS) and providers' variable profits (PS) under counterfactual scenario of exclusively single rooms (€000,000)

	status quo	**a)**	**b)**	**c)**	**d)**
CS	37,500	38,100	35,000	36,500	36,600
PS	6770	7120	5670	6390	4390
ΔCS		0.018	-0.066	-0.026	-0.024
ΔPS		0.051	-0.162	-0.055	-0.351

Consumer surplus and providers' variable profits are calculated using the expressions (10) and (11) and are aggregated at the level of Germany. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

Table 6 presents the changes in consumer surplus and providers' variable profits at the level of Germany. The major determinant of welfare changes are capacity reductions. Under the scenario of constant capacities, transforming all double rooms into singles leads to a total increase in consumer surplus of 1.8% and 5.1% in providers' variable profits. Consumer welfare improves due to higher utility derived from a nursing home and a larger share of the care-dependent population in stationary long-term care. Providers' variable profits decrease despite the price decline. This is

[13]Note that our counterfactual scenarios are "static" and that no market entry/exit with potential price effects take place. Furthermore, we abstract from policy implementation costs, which are likely to spill over to the prices.

due to a higher utilization of nursing home capacities. Under scenario b), the negative welfare effects of lower capacities clearly outweigh the positive welfare effects of single rooms, which leads to a 6.6% decrease in consumer surplus and 16.2% in providers' variable profits. Under scenario c), the negative welfare effects of reduced capacities prevail, due to which consumer surplus decreases by 2.6% and providers' variable profits by 5.5%. Finally, under scenario d), consumer surplus declines by 2.4% and providers' variable profits by 35%. Although the payers have a higher bargaining power and are able to negotiate lower prices, consumer surplus declines as a result of the reduced supply of nursing home places. Therefore, the effects of the policy mandating exclusively single rooms are welfare-enhancing only if the capacities remain unchanged and the bargaining power is symmetric.

6 Conclusion

This paper evaluates the welfare implications of policy mandating exclusively single rooms in German nursing homes. To this end, we a) estimate a structural model of demand for stationary long-term care, b) estimate a model of bargaining between providers and payers, and c) quantify the welfare effects of the policy under different implementation scenarios. We use a panel dataset of all German nursing homes providing stationary long-term care for elderly individuals for 2007 and 2009 and estimate the demand using the fixed-effects regression with instrumental variables.

Our estimation results indicate that nursing home residents significantly dislike higher prices, but positively value facility size and single rooms. Using these estimates, we calculate the average own-price elasticity at -0.752. The value necessary to produce the current price level under the hypothetical scenario of Bertrand-Nash competition is -2.552, implying that price negotiations hinder excessive price increases. Furthermore, we find that the long-term care insurance rates affect the negotiated prices: the average own-price elasticity under the assumption of full co-payments would be higher than under the current scheme and is estimated at -1.405, while zero co-payments would generate a price-insensitive demand. The average cross-price elasticities with respect to nursing homes in the same and in different groups are 0.041 and 0.005, respectively. This demonstrates a low willingness of nursing home residents to transfer. The Nash model of bargaining between providers and payers indicates that the average ratio of marginal costs to prices is 0.593. This estimate is likely below the true long-term care markups, since we are unable to control for the fixed costs associated with operating a nursing home.

Using the estimated demand and supply parameters, we simulate the equilibrium prices, market shares, and welfare changes under the counterfactual scenario of exclusively single rooms. We consider four implementation scenarios: a) constant capacities, where the same number of beds is secured by expanding the facilities or, if possible, by splitting double into single rooms; b) reduced capacities, whereby double rooms are transformed into singles without being divided; c) reduced capacities, whereby 50% of double rooms are transformed into single rooms by being divided and 50% without being divided; and d) equivalent to scenario c), with the payers' bargaining power of 2/3 instead of 1/2. Although the prices decrease under each scenario, the welfare implications are predominantly negative due to a lower supply of nursing home places. The policy of single rooms has welfare-enhancing effects for both consumers and providers only under scenario a). In the remaining

cases, reduced nursing home capacities force more care-dependent individuals out of stationary long-term care, which reduces both consumer surplus and providers' variable profits. The decline in profits is particularly high if the payers manage to achieve higher bargaining power.

Although the single rooms enhance the well-being of nursing home residents, the welfare implications of this policy are not straightforward and hinge upon its implementation. Retaining constant capacities by expanding the facilities or by transforming the double rooms into single ensures higher welfare. Yet, rebuilding the nursing homes to provide only single rooms is almost certainly associated with shrinking capacities. In this case, policy mandating exclusively single rooms has pronouncedly negative welfare implications. Countering them with higher long-term care insurance rates, which reduce the co-payments, would increase the negotiated prices. If the recent policy change in Baden-Wuerttemberg and North Rhine-Westphalia is to be adopted as a model for future interventions, the regulators must secure an unchanged supply of nursing home places by stimulating investment in new facilities.

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7 Appendix

Table 7: Robustness checks

$ls_j = lns_j - lns_0$	**(1)**	**(2)**	**(3)**
σ [ownership]	0.50617***	0.44954***	
	(0.01574)	(0.01134)	
σ_1 [non-profit]			0.49982***
			(0.01151)
σ_2 [profit]			0.53498***
			(0.01372)
Price	-0.00029***	-0.00030***	-0.00026***
	(0.00009)	(0.00006)	(0.00006)
Size	0.00451***	0.00491***	0.00449***
	(0.00036)	(0.00036)	(0.00035)
Extra facility	0.00192	0.00247	0.00146
	(0.00618)	(0.00627)	(0.00602)
Single rooms [%]	0.07985**	0.08089**	0.08095**
	(0.03666)	(0.03279)	(0.03142)
Constant	-2.82872***	-2.99902***	-2.84403***
	(0.09787)	(0.07244)	(0.06803)
Observations	14,205	14,205	14,205
Facility FE	yes	yes	yes
Time FE	yes	yes	yes
IV (σ)	yes	yes	yes
IV (price)	yes	yes	yes
Adjusted R-squared	0.68	0.67	0.70
Underidentification test	46.16	124.26	121.47
	(0.00)	(0.00)	(0.00)
Weak ID test	15.49	21.13	17.69
Sargan test	0.11	3.64	3.28
	(0.74)	(0.46)	(0.51)

The dependent variable is $ls_j = lns_j - lns_0$, where s_j = total number of care-dependent in facility j/total market size, s_0 = market share of outside option/total market size. Comparison to the baseline scenario: (1) two instead of five price instruments, (2) within-group share instrument – number of nursing home places in nursing homes with the same ownership type, (3) separate dummies for the correlation of preferences for non-profit and for for-profit nursing homes. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

Figure 1: The average ratio single rooms to total available places, 2007-2009

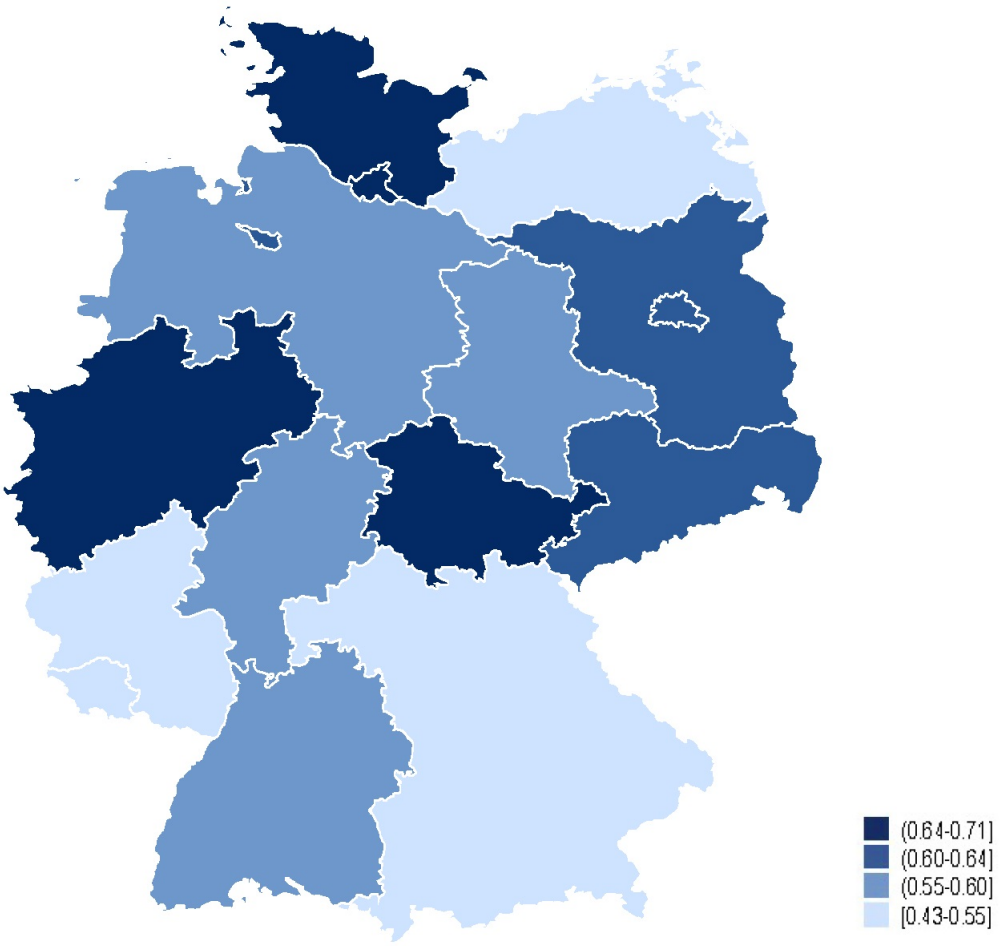

Table 8: Status quo values of consumer surplus (CS) and providers' variable profits (PS) at the federal-state level (€000,000)

	status quo	
Federal state	**CS**	**PS**
Schleswig-Holstein	3010	405
Lower Saxony	3460	772
Bremen	487	49.7
North Rhine-Westphalia	6660	1410
Hessen	2250	438
Rheinland-Palatinate	1010	343
Baden-Wuerttemberg	2960	760
Bavaria	3340	1060
Saarland	353	86.6
Brandenburg	9550	449
Mecklenburg-West Pomerania	542	162
Saxony	2090	404
Saxony-Anhalt	1060	220
Thuringia	702	205

Scenarios: Symmetric bargaining power ($\gamma = \frac{1}{2}$) and (a) constant capacities, (b) reduced capacities, whereby double rooms are transformed into singles without being divided, (c) reduced capacities, whereby 50% of double rooms are transformed into singles by being divided and 50% without being divided, (d) equivalent to scenario (c), with the payers' bargaining power of $\gamma = \frac{2}{3}$. Due to the organization of the long-term insurance funds, Hamburg is merged with Schleswig-Holstein and Berlin with Brandenburg. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

Table 9: Consumer surplus in a hypothetical market (€000,000) and changes with respect to status quo market

Federal state	**a)**	**b)**	**c)**	**d)**	**Δa)**	**Δb)**	**Δc)**	**Δd)**
Schleswig-Holstein	2850	2700	2770	2830	-0.052	-0.105	-0.079	-0.060
Lower Saxony	3550	3320	3430	3450	0.024	-0.405	-0.009	-0.003
Bremen	497	464	479	480	0.020	-0.047	-0.016	-0.014
North Rhine-Westphalia	6810	6280	6530	6530	0.022	-0.058	-0.020	-0.020
Hessen	2300	2110	2200	2200	0.024	-0.062	-0.020	-0.020
Rheinland-Palatinate	1040	941	989	989	0.031	-0.067	-0.020	-0.020
Baden-Wuerttemberg	3020	2780	2900	2900	0.018	-0.061	-0.023	-0.023
Bavaria	3440	3110	3200	3290	0.030	-0.069	-0.022	-0.015
Saarland	366	328	346	346	0.036	-0.073	-0.021	-0.021
Brandenburg	9710	8710	9190	9200	0.013	-0.086	-0.038	-0.037
Mecklenburg-West Pomerania	556	508	531	535	0.026	-0.063	-0.020	-0.013
Saxony	2200	2040	2120	2050	0.056	-0.020	0.020	-0.019
Saxony-Anhalt	1090	1010	1050	1050	0.025	-0.049	-0.014	-0.014
Thuringia	717	672	695	696	0.020	-0.043	-0.011	-0.008

Scenarios: Symmetric bargaining power ($\gamma = \frac{1}{2}$) and (a) constant capacities, (b) reduced capacities, whereby double rooms are transformed into singles without being divided, (c) reduced capacities, whereby 50% of double rooms are transformed into singles by being divided and 50% without being divided, (d) equivalent to scenario (c), with the payers' bargaining power of $\gamma = \frac{2}{3}$. Due to the organization of the long-term insurance funds, Hamburg is merged with Schleswig-Holstein and Berlin with Brandenburg. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.

Table 10: Providers' variable profits in a hypothetical market (€000,000) and changes with respect to status quo market

Federal state	**a)**	**b)**	**c)**	**d)**	**Δa)**	**Δb)**	**Δc)**	**Δd)**
Schleswig-Holstein	459	370	416	280	0.131	-0.088	0.026	-0.309
Lower Saxony	839	685	763	502	0.085	-0.113	-0.011	-0.350
Bremen	56.0	45.1	50.6	34.9	0.127	-0.090	0.018	-0.300
North Rhine-Westphalia	1550	1260	1410	969	0.099	-0.110	-0.005	-0.313
Hessen	490	376	432	283	0.119	-0.141	-0.012	-0.353
Rheinland-Palatinate	343	273	309	214	-0.000	-0.205	-0.099	-0.376
Baden-Wuerttemberg	786	624	706	494	0.034	-0.179	-0.071	-0.350
Bavaria	993	795	895	595	-0.063	-0.250	-0.155	-0.439
Saarland	96.9	71.7	84.6	58.5	0.119	-0.172	-0.024	-0.324
Brandenburg	529	417	473	326	0.179	-0.071	0.053	-0.274
Mecklenburg-West Pomerania	163	123	144	97.7	0.005	-0.239	-0.114	-0.397
Saxony	373	283	321	267	-0.078	-0.300	-0.208	-0.339
Saxony-Anhalt	235	181	208	144	0.067	-0.177	-0.055	-0.345
Thuringia	202	169	185	127	-0.015	-0.174	-0.097	-0.380

Scenarios: Symmetric bargaining power ($\gamma = \frac{1}{2}$) and (a) constant capacities, (b) reduced capacities, whereby double rooms are transformed into singles without being divided, (c) reduced capacities, whereby 50% of double rooms are transformed into singles by being divided and 50% without being divided, (d) equivalent to scenario (c), with the payers' bargaining power of $\gamma = \frac{2}{3}$. Due to the organization of the long-term insurance funds, Hamburg is merged with Schleswig-Holstein and Berlin with Brandenburg. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Pflegestatistik, 2007-2009, own calculations.